NAVFAC
Naval Facilities Engineering Command

Technical Memorandum
TM-CHENG/05-010-SCA
REVISION C

NAVFAC System Certification Authority (SCA) Policy for Inspection and Testing Shore-Based Hyperbaric Gas Storage Vessels and Associated Relief Valves

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DESCRIPTION OF REVISIONS

C

1. Reconfigured paragraph 1.3 to provide guidance for Department of Transportation (DOT) flasks.

2. Revision (C) changes the periodicity of flask recertification from every 6 years to every 12 years. Technical justification is based upon NAVSEA Ser 05Z42/129, dtd 07 Jun 2010 and NAVFAC MEMO dated 21 April 2014.

3. To support the change in flask periodicity, paragraphs 2.2.6 through 2.2.7.3 have been added. For commands to change their periodicity, they must be able to prove to the NAVFAC SCA that they are maintaining their flasks in a dry condition (at least negative 40 F dew point or better).

4. Information has been corrected and added to section 2.3.1 to clarify where to obtain ASME U-1A Forms for flasks (The National Board of Boiler and Pressure Vessel Inspectors).

5. Updated Table 3.1 – Volume Tank Inspection Periodicity.

6. Added paragraph 3.1.1 to provide further clarification of the volume tank table.

7. Added paragraph 3.1.2 to provide inspection requirements for heat exchangers, potable water tanks and sanitary water tanks.

8. Added paragraph 3.2.2 – Volume Tank Wash-down requirement for Volume Tanks in Corrosive environments.

9. Added paragraph 3.3.5 – Internal Inspection which details the new internal inspection form for Volume Tanks. This new form is located in Appendix A.

10. Added new internal inspection form to Appendix A for Volume Tanks.

11. Clarifications have been made to Appendix C as follows: paragraph 2.0 of Revision (B) has been removed; details for the required use of qualified procedures have been added; inventory of cal blocks has been updated; points of contact and check out details for cal blocks have been updated. The OCSF form and example form have been updated.

12. Appendix D and E from Revision B have been switched. Appendix D from Revision (B) is now Appendix E in Revision (C) and vice versa.

13. Clarification changes made to sections D.1, D.2 and D.5.1.1 through D.5.1.5 in Appendix D. Also, Table D.1 has been updated and Table D.2 has been added.

14. Appendix E has been reconfigured. Commands shall now contact NAVFAC SCA to obtain the current list of activities authorized to test/repair ASME relief valves.

POLICY FOR SHORE-BASED HYPERBARIC GAS STORAGE VESSELS AND ASSOCIATED RELIEF VALVES

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APPENDICES

TABLES

Section 1: INTRODUCTION

1.1 Scope. This Technical Memorandum (TM) provides maintenance guidance for hyperbaric gas storage vessels in conjunction with diver's life support Planned Maintenance System (PMS)[1]. The requirements in this TM supersede the requirements of UFC 3-430-07 "Inspections and Certification of Boilers and Unfired Pressure Vessels." As authorized by NAVFAC letter CHENG/05-010, dtd 22 Feb 05, certification of hyperbaric gas storage vessels will now be under the authority of the NAVFAC Hyperbaric System Certification Authority (SCA). The NAVFAC SCA has responsibility to certify ashore diving and hyperbaric systems. Therefore, this guidance applies to ashore diving and hyperbaric systems that are both NAVFAC SCA certified and non-certified gas charging systems.

1.2 Application. This TM is intended to address the larger system pressure vessels that require periodic inspections and dedicated relief valve protection. This includes pressure vessels located within ashore divers gas charging systems and unmanned pressure test facilities. This document does not apply to the smaller pressure vessel components such as compressor moisture separators and filter towers. This TM also provides relief valve maintenance instructions associated with certified unmanned pressure test facilities. This document is divided into three sections addressing flasks, volume tanks, and relief valves. Each section begins by addressing PMS periodicity and the schedule that shall be implemented. Following periodicity, overall inspection and testing requirements are presented. Also, the inspection details are identified, and are further supported by additional information that is either referenced in each section or contained within the appendices of this document.

1.3 Department of Transportation (DOT) Flasks. For commands that have DOT flasks installed in ashore hyperbaric systems, contact NAVFAC SCA for inspection guidance. This includes DOT "K" or "T" bottles permanently installed in an ashore system.

[1] Reference NAVFAC SCA MEMO dtd Mar 18: Technical Justification For Changes To Hyperbaric And Diving Systems PMS.

Section 2: HIGH-PRESSURE FLASKS (ASME and MIL-F-22606)[2]

2.1 Periodicity. All high-pressure divers breathing gas flasks (Air, Oxygen, Helium, Helium-Oxygen and Nitrogen) shall be phased into a new periodicity of ultrasonic inspection (including shear wave UT) and recertification every 12 years (144M). NAVFAC hyperbaric diving systems shall adjust their Planned Maintenance Schedules (PMS) to reflect a 12-year start date from their last inspection. For example, if a flask was inspected in September 2009, and has an upcoming inspection already scheduled for 2015, the command has the option of performing a new inspection and establishing a new PMS clock start date. The next inspection required would come due in September 2027. Another option is to set the next PMS date due 12 years from previous inspection with a new due date of September 2021. C

2.2 Inspection Requirements. The following sections provide details on inspection requirements for flasks.

2.2.1 Baseline Inspection. It is the responsibility of each command to review the last three flask wall thickness UT or shear wave inspections for each flask to verify there has been no progressive material loss. These records shall be maintained and act as the baseline inspection for the vessel. If this cannot be accomplished, then a new baseline inspection is required.

2.2.2 Internal Inspection. Internal visual inspections are not required unless a specific reason warrants it. Internal inspections shall be conducted when loss of wall thickness is found or other abnormalities are found through thickness or shear wave ultrasonic non-destructive testing (NDT).

2.2.3 Hydrostatic Testing. Hydrostatic testing is no longer a requirement to recertify a flask. Independent technical analysis has determined that shear wave ultrasonic tests will find cracks, when present. This test along with no detected loss of wall thickness will indicate vessel integrity. The effort required to get a flask cleaned and dried after becoming wet from hydrostatic testing is not warranted. An elevated pneumatic pressure test above maximum joint tightness testing is not required. Hydrostatic testing is only associated with repairs to pressure vessel boundary.

2.2.4 Shear Wave Ultrasonic Testing. ASME flasks previously inspected to NAVFAC requirements may not have been subjected to this type of ultrasonic testing. MIL-F-22606 flasks inspected in accordance with Naval Ship's Technical Manual (NSTM Chapter 551) have been subjected to this type of NDT. This requirement is added to ASME flasks to ensure cracks are not present, and supports the technical decision to delete hydrostatic testing. See Appendix C for further guidance.

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[2] ASME stands for American Society of Mechanical Engineers. An ASME flask can be identified by finding a unique stamp (below) on the flask, as well as a National Board number. MIL-F-22606 flasks also have stamped identification markings.

2.2.5 External Inspection. External inspection of high-pressure flasks shall be conducted on annual bases. The NAVFAC SCA requires this inspection to be documented by completion of the form established in Appendix A of this document.

2.2.6 Flask External Wash-Down. For flasks and support piping/controls located in corrosive environments (i.e. exposed to salt spray or adjacent to a chlorinated pool), a complete external wash-down of all flasks and support piping/controls with clean water is required annually. The command shall ensure that all portions of the flask are washed down and completely dry within 24 hours. C

2.2.7 Dew Point Documentation. The PMS change in periodicity from 6 years to 12 years requires each command to be able to prove to the SCA that their system is maintaining their flasks at a minus 40 F degrees dew point or lower. Most installed dryer/purification systems will achieve minus 65 degrees F in processed divers air. Furthermore, many of these systems have a moisture monitoring system that shuts down the compressor upon detecting excessive moisture. However, many moisture monitors do not provide a dew point reading and there is historical evidence that these systems can fail. Thus this added requirement to obtain the dew point documentation to protect the health of steel HP flasks is warranted. There are three approaches that commands can take to achieve this requirement and they are described in sections 2.1.6.1 – 2.1.6.3. If the command cannot accomplish any of these, then they must continue with the 6-year ultrasonic periodicity inspection requirement. There may be alternative methods, but these would need to be approved by the NAVFAC SCA.

2.2.7.1 Approach 1. The command can include dew point measurements during compressor sampling. Each command is currently required to take gas samples every 6 months. When ordering the sample kit, the command can order a Drager vapor tube from the selected analysis laboratory.

2.2.7.2 Approach 2. Each command has the option to procure their own sampling equipment. There are a number of vendors that provide Drager equipment. The initial start-up cost is greater than the small added cost to the above mentioned Drager kit. However, over the life of the system it could be cheaper. Each command has options regarding how and where to take the sample. When using a low pressure kit, a sample shall be taken down stream at a Low Pressure (LP) source, such as a LP maintenance panel or BIBS Air.

2.2.7.3 Approach 3. Some commands have the ability to obtain the dew point directly from their installed calibrated equipment and keep a daily log of the readings. Commands that have this capability are exempt from the additional dew point sampling.

2.3 Inspection Procedures. Flask inspections shall be in accordance with Naval Ships' Technical Manual (NSTM S9086-SY-STM-010 Chapter 551) as supported by the NAVSEA Technical Publication "Requirements For Nondestructive Testing Methods" (NAVSEA T9074-AS-GIB-010/271). Any questions regarding application of requirements shall be forwarded to the NAVFAC SCA prior to conducting inspection. See Appendix C for further guidance.

2.3.1 Documentation. For ASME flasks, each command shall provide a copy of the associated flask Form U-1A (Manufacturers' Data Report For Pressure Vessels) to the qualified NDT examiner for wall thickness information. An example Form U-1A can be found in Appendix B of this document. This is required because ASME flasks vary by design, while MIL-F-22606 C

flasks are manufactured to a specification of known minimal wall thickness. If a command does not have a copy of their flask Form U-1A, they should contact the NAVFAC SCA for guidance. If the SCA does not have a copy, the command shall obtain a copy from the National Board of Boiler and Pressure Vessel Inspectors (614-888-2463 or http://www.nationalboard.org/). For older flasks, ASME used the term "nominal wall thickness" that includes an added diameter tolerance. The minimum wall thickness for these flasks is 12.5% less than the nominal wall thickness. For further clarification contact NAVFAC SCA.

2.3.2 Documentation Retention. Each command is responsible for maintaining all flask records in an auditable fashion for the life of the system, including the records proving dew point maintained. These records shall retain all NDT readings. All readings from previous NAVFAC Boiler Inspector examinations shall be maintained with these records. Each command shall review their past wall thickness measurements prior to determining how they will phase in this new PMS. Should questions arise regarding a potential trend showing loss of flask wall thickness, the NAVFAC SCA shall be contacted.

2.3.3 NDT Qualifications. Each command shall schedule and fund these inspections. Each command is responsible for ensuring only qualified NDT examiners perform the work. A list of qualified examiners does not exist. NSTM Chapter 551 and NAVSEA Technical Publication 271 contain details of qualification requirements. A company that meets the American Society for Non-Destructive Testing (ASNT) shall also be considered qualified. See Appendix C for details regarding requirements for use of a qualified procedure.

2.3.4 External Inspection. The inspection details contained within this document do not change the periodicity of required annual external inspection. However, for NAVFAC shore-based systems, the annual external inspection requires additional documentation. Appendix A of this document provides an external inspection form that shall be completed during the annual inspection. This is mandatory to support the new 12-year internal inspection periodicity for flasks.

Section 3: LOW/MEDIUM PRESSURE VOLUME TANKS

3.1 Periodicity. The following matrix shall be followed:

Table 3.1 – Volume Tank Inspection Periodicity

Tank Type	External Visual Inspection	Internal[3] Visual Inspection
Air Volume Tank - Medium/Low Pressure Dry Divers Air (Carbon Steel)	3-year	3-year
Air Volume Tank – Medium/Low Pressure Dry Divers Air (Stainless Steel)	3-year	6-year See 3.1.1
Fire Suppression System Tank Medium/Low Pressure Wet Divers Air (Stainless and Carbon Steel)	1-year	2-Year

3.1.1 Clarification. All volume tanks shall be scheduled for internal inspections according to Table 3.1 with the following exceptions. The command may choose to perform a straight wall Ultrasonic Thickness (UT) measurement on dry stainless steel volume tanks in lieu of an internal inspection. Alternative guidance is also provided when volume tanks cannot be internally inspected[3]. Shear wave ultrasonic testing of volume tanks is not required. If any flaw indicators (abnormal readings) arise during the UT, then internal inspection shall be performed. If flaws (i.e. corrosion, pits, cracks) are discovered during internal visual inspection, than UT shall be applied to determine flaw size. If no flaws are noted during an external or internal inspection, NDT of the volume tank is not required.

3.1.2 Heat Exchangers/Potable Water Tanks/Sanitary Water Tanks. Heat exchangers, potable water tanks and sanitary water tanks shall follow the same inspection guidelines as Fire Extinguishing System (FES) tanks.

3.2 Inspection Requirements. The following sections provide details on inspection requirements for volume tanks.

3.2.1 External Inspection. External inspections shall be conducted as required in Table 3.1 with documentation (see Appendix A). This external inspection should be performed in conjunction with the high pressure flask inspections.

3.2.2 Volume Tank External Wash-Down. For volume tanks and piping located in corrosive environments (i.e. exposed to salt spray or adjacent to a chlorinated pool), a complete external wash-down of the volume tank and piping with clean water is required annually. The

[3] Some pressure vessels are not easily inspected. The NAVFAC SCA recognizes that some items such as in-line gas accumulators may not have removable inspection plugs. In these cases contact the NAVFAC SCA for possible alternatives to the internal inspection

command shall ensure that all portions of the volume tank are washed-down and completely dry within 24 hours.

3.2.3 Hydrostatic Testing. Hydrostatic testing shall not be required for PMS. Hydrostatic testing for vessel strength is only associated with repairs to pressure vessel boundary.

3.3 Inspection Procedures. The inspection procedure for volume tanks contained within NAVSEA 00C3-PI-005 shall apply with the exceptions of the periodicity and forms provided herein. NAVFAC periodicities shall follow Table 3.1 and the required forms are located in Appendix A.

3.3.1 Documentation. For ASME volume tanks, when NDT is performed, each command is required to provide a copy of the associated Form U-1A (Manufacturers' Data Report For Pressure Vessels) to the qualified NDT examiner for wall thickness information (an example Form U-1A can be found in Appendix B of this document).

3.3.2 Documentation Retention. Each command is responsible for maintaining all records. Records shall be maintained in an auditable fashion for the life of the system. These records shall retain all NDT readings. All readings from previous NAVFAC Boiler Inspector examinations shall be maintained with these records.

3.3.3 NDT Qualifications. Each command is required to schedule and fund these inspections. Each command is responsible for ensuring only qualified NDT examiners perform the work. NSTM Chapter 551, NAVSEA Technical Publication 271, and NAVSEA 00C3-PI-005 contain details of qualification requirements.

3.3.4 External Inspection. Appendix A of this document contains a form that shall be completed when the external inspection of the volume tanks are completed. The external inspection has been determined to be prudent because historically volume tanks that have been found to have pitting problems were detected by external weepage.

3.3.5 Internal Inspection. Appendix A of this document contains a form that shall be completed when the internal inspection of the volume tanks are completed.

Section 4: AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) RELIEF VALVES

4.1 Periodicity. Relief valves protecting all hyperbaric chambers, flasks, and volume tanks shall remain on a 3-year calibration/re-test periodicity. ASME relief valves protecting ASME pressure vessels are required to follow the procedures provided within this ECB. Relief valve testing in accordance with UFC 3-430-07 "Inspection and Certification of Boilers and Unfired Pressure Vessels" now excludes hyperbaric vessels and therefore no longer applies.

4.2 Test Requirements. Each ASME relief valve that is tested and/or first level repaired as described in Section 4.3 must be accomplished using the NAVFAC Relief Valve Maintenance Form per Appendix D of this document. The testing or limited repair shall be accomplished by a NAVFAC authorized company or government shop. Contact NAVFAC SCA for a list of the current authorized companies or government shops.

4.3 Repairs – Cutting the Seal Wire. If during testing the relief valve fails, then repair would be initiated by cutting the seal wire. There are two levels of repair authorized as follows. The first level of repair is an adjustment or limited replacement of original equipment manufacturer parts in-kind. It can be performed prior to re-testing provided it is documented. The next level is full repair of the relief valve including configuration changes such as changing seat material, springs, or pressure boundary piece parts. This full repair can only be performed by the original manufacturer or a shop authorized by the National Board of Boiler and Pressure Vessel Inspectors (NBBI) to repair and label the valve with a new VR nameplate.

4.4 In-Place Relief Valve Testing. On a limited basis, commands are allowed to perform a crack and re-seat test of installed relief valves without their removal. This is only allowed with prior NAVFAC SCA approval. Approval will be based upon the need and review of the procedure. Safety provisions are required to ensure system over pressurization cannot occur. Typically this is only allowed if an independent testing authority (such as METCAL) uses specialized equipment to a specific service-proven procedure that meets necessary quality assurance plans for accuracy and consistency.

4.5 Documentation. The NAVFAC Relief Valve Maintenance Form shall be filed with the associated REC. This form is required for the following reasons: First, the adjustments required, if any, will be documented such that trend analysis is possible. Second, the work performed and the way it was performed is documented such that the NAVFAC SCA can reconstruct details of testing or repair procedures. Third, the Objective Quality Evidence (OQE) for all pieces installed will be documented. Finally, documentation will be obtained that divers breathing gas cleanliness has been maintained. The last two points are required by REC, however, completion of this form will re-enforce the importance and will also support ashore gas charging systems that are not certified.

APPENDIX A
PRESSURE VESSEL EXTERNAL/INTERNAL INSPECTION FORMS

A.1 PRESSURE VESSEL EXTERNAL INSPECTION FORM

The pressure vessel external inspection form shall be completed annually for all flasks and volume tanks. The forms shall be retained with the systems flask/volume tank records and available for NAVFAC SCA review.

A.2 VOLUME TANK INTERNAL INSPECTION FORM

The volume tank internal inspection form is solely used for system volume tanks at the periodicity provided in Table 3.1. Flasks no longer require an internal inspection. The forms shall be retained with the systems volume tank records and available to NAVFAC SCA review.

NAVFAC Pressure Vessel (PV) External Inspection Form

This form shall be completed and retained with the systems flask/volume tank inspection records. The intent is to document exterior PV conditions and to support the change to ASME PV PMS periodicity. This document shall be completed when the PMS is conducted. All observations made shall be considered significant and that information shall be provided for future inspections. Initial inspections will likely find small dings and dents that have been previously accepted. All past PV inspection documentation shall be referenced where available. **Anything that could be added to this form that will allow future reconstruction of existing conditions (sketches showing locations or more preferably digital photographs) shall be included.** The intent is to capture the existing condition of the installed PVs and to track their conditions. When questionable anomalies are found, the command shall take additional action such as localized ultrasonic (UT) wall thickness measurements and/or other non-destructive examinations to verify PV integrity (ie – PT, shear wave UT, or RT).

System PV Designation_____ (i.e. AHP 1-1) PV SN _____

PV External Condition[1]_____

System PV Designation_____ (i.e. AHP 1-1) PV SN _____

PV External Condition[1]_____

System PV Designation_____ (i.e. AHP 1-1) PV SN _____

PV External Condition[1]_____

ADD SHEETS FOR ADDITIONAL FLASKS AS NECESSARY

External Inspection Form Signature **Print Name** **Date**

[1] Corrosion, gouges, dents and nicks shall be closely examined to determine depth of defect. Any defect 1/16 (0.0625) inch or greater in depth shall be cause for ultrasonic examination of the affected area to determine the remaining wall thickness. Documentation of prior acceptance by the previous NAVFAC boiler inspection documentation shall be added to this document to avoid duplicate UT examinations.

NAVFAC Volume Tank (VT) Internal Inspection Form

This form shall be completed and retained with the systems volume tank inspection records. The intent is to document internal VT conditions and to support the change to ASME VT PMS periodicity. This document shall be completed when PMS is conducted. All observations made shall be considered significant and that information shall be provided for future inspections. Initial inspections will likely find small dings and dents that have been previously accepted. All past tank inspection documentation shall be referenced where available. **Anything that could be added to this form that will allow future reconstruction of existing conditions (sketches showing locations or more preferably digital photographs) shall be included.** The intent is to capture the existing condition of the installed VTs and to track their conditions. When questionable anomalies are found, the command shall take additional action such as localized ultrasonic (UT) wall thickness measurements and/or other non-destructive examinations to verify VT integrity (ie – PT or RT).

System VT Designation_____ (i.e. VT -ALP -1) VT SN _____

VT Internal Condition[1]_____

System VT Designation_____ (i.e. VT-ALP -1) VT SN _____

VT Internal Condition[1]_____

System VT Designation_____ (i.e. VT-ALP -1) VT SN _____

VT Internal Condition[1]_____

ADD SHEETS FOR ADDITIONAL VOLUME TANKS AS NECESSARY

Internal Inspection Form Signature **Print Name** **Date**

[1] Corrosion, gouges, dents and nicks shall be closely examined to determine depth of defect. Any defect 1/16 (0.0625) inch or greater in depth shall be cause for ultrasonic examination of the affected area to determine the remaining wall thickness. Documentation of prior acceptance by previous NAVFAC boiler inspection documentation shall be added to this document to avoid duplicate UT examinations.

APPENDIX B
FORM U1-A: MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS

B.1 U1-A FORM

The manufacturers' data report (U1-A Form) for pressure vessels is required documentation for ASME pressure vessels that shall be maintained with the pressure vessel records. An example of a U1-A form is provided on the following page. The U1-A form contains critical information required to properly conduct inspections of flask and volume tanks. Further information on U1-A forms can be found in section 2.3.1.

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS

(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by CP INDUSTRIES, CHRISTY PARK PLANT, 2214 WALNUT STREET, McKEESPORT, PA 15132 (Name and address of manufacturer)

2. Manufactured for EPSILON SYSTEMS SOLUTIONS, INC., 605 COMMERCE STREET, PORTSMOUTH, VA 23707 (Name and address of purchaser)

3. Location of installation NOT KNOWN (Name and address)

4. Type HORIZ. (Horiz. or vert. tank) | 50145 (Mfgr's serial No.) | (CRN) | 4X16006 REV. 2 (Drawing No.) | 50145 (Nat'l Bd. No.) | 2009 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 2007 (Year)

to 2008A AND APPENDIX 22 (SF=3) (Addenda (Date)) | (Code Case Nos.) | (Special Service per UG-120(d))

6. Shell: SA372 GRADE J, CLASS 70 (Matl. (Spec. No., Grade)) | 1.366" (Min. Thk. (in.)) | .0625" (Corr. Allow. (in.)) | 20" (Diam. O.D. (in.)) | 9'-2" (Length (overall) (ft. & in.))

7. Seams: SEAMLESS (Long. (Welded, Dbl., Sngl., Lap, Butt)) | NONE (R.T. (Spot or Full)) | 100 (Eff. (%)) | (H.T. Temp.(F)) | (Time (hr)) | SEAMLESS (Girth (Welded, Dbl., Sngl., Lap, Butt)) | NONE (R.T. [Spot, Eff. (%) or Full]) | 1 (No. of Courses)

8. Heads: (a) Matl. SAME AS 6. (Spec. No., Grade) (b) Matl. SAME AS 6. (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	ENDS	1.366"	.0625"					10"		CONCAVE
(b)	(INTEGRALLY FORGED HEADS AND NECKS)									

If removable, bolts used (describe other fastenings) (Matl., Spec. No., Gr., Size, No.)

9. MAWP 5500 (internal) N/A (external) psi at max. temp. +200 (internal) N/A (external) °F.

Min. design metal temp. -20 °F at 5500 psi. Hydrostatic test pressure 8250 psi.

10. Nozzles, inspection and safety valve openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
INLET/OUTLET	2	2 3/4"	THREAD				FORMED IN	HEADS

11. Supports: Skirt NO (Yes or no) Lugs 0 (No.) Legs 0 (No.) Other NONE (Describe) Attached N/A (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: (Name of part, item number, Mfgr's. name and identifying stamp)

CONSTRUCTED IN ACCORDANCE WITH APPENDIX 22, INTEGRALLY FORGED VESSELS. DRY GAS STORAGE, NON CORROSIVE SERVICE.
VESSEL MATERIAL IMPACT TESTED PER UHT-6. LIQUID Q&T PER SA 372. SC 28480
NOT FOR HYDROGEN OR CNG. MT NDT. VESSEL OAL: 11'-6" PIPE NO: P242 MO 4482

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 1127 expires 3/9, 20 12.

Date 9/9/2009 Co. name CP INDUSTRIES (Manufacturer) Signed (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by CP INDUSTRIES at McKEESPORT, PA. I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of PENNSYLVANIA and employed by ARISE INCORPORATED have inspected the component described in this Manufacturer's Data Report on 9-15, 2009, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 9-15-09 Signed (Authorized Inspector) Commissions NB 11091A PA 2597 (Nat'l Board (incl. endorsements) State, Prov. and No.)

APPENDIX C
NON-DESTRUCTIVE TESTING (NDT) GUIDANCE

C.1 INTRODUCTION

This appendix introduces the process for commands to obtain flask calibration blocks necessary to accomplish shear-wave ultrasonic examination. This appendix also provides details regarding requirements for use of a qualified procedure.

C.2 ULTRASONIC SHEAR WAVE THICKNESS MEASUREMENTS

C.2.1 PROCEDURE FOR OBTAINING CALIBRATION STANDARDS

The form on the page 16 may be used to obtain calibration standards. The point of contact is the Facility Manager at the NAVFAC Ocean Construction Equipment Inventory (OCEI) Facility. Copies of all requests sent to OCEI shall also be sent to NAVFAC SCA. An example of a form that has been completed can be found on page 17.

C.3.1 FLASK CALIBRATION BLOCKS

NAVFAC offers an inventory of calibration blocks and rings for command use. All ultrasonic inspections of flasks require the use of calibration blocks. When clearances around the flasks are limited such as with tightly stacked horizontal flasks, then the calibration ring may be used to increase the ultrasonic signal reach. Also, if your flask specifications are not included in Table C3.1, there are some procedure allowances. Contact the NAVFAC SCA if you have any questions about conducting your flask inspection.

Table C3.1 – Flask Calibration Blocks

CAL Block Stamped Information	**Related Flask Information**
ASME SA372 GRADE J CL70 18" OD	0.764" Min. Wall Thickness MAWP 3304 psi (App. 22 SF=3) w/ no Corr. Allow.
ASME SA372 GRADE J CL70 20" OD	1.303" Min. Wall Thickness MAWP 5500 psi (App. 22 SF=3) w/ no CA
MIL-F-22606 Class 3000 18" OD	0.561" Min. Wall Thickness TYPE GF or CD per Ref. (1)
MIL-F-22606 Class 5000 18" OD	0.933" Min. Wall Thickness TYPE GF or CD per Ref. (1)
DOT-3AA-2400 24" OD	0.584" Min. Wall Thickness MAWP 2400 psi w/ no CA
DOT 107A 18.5" OD	0.875" Min. Wall Thickness MAWP 5000 psi w/ no CA
ASME SF 3 & 4 18" OD SA372 GRADE J CL70	0.764" Min. Wall Thickness MAWP 3232 psi (App. 22 SF=3) w/ no CA
ASME SA372 GRADE F CL70 10" OD	0.784" Min. Wall Thickness MAWP 5250/7000 psi (App. 22 SF=4/3) w/ no CA
CAL Ring Stamped Information	**Related Flask Information**
ASME SF 3 & 4 18" OD SA372 GRADE J CL70	0.764" Min. Wall Thickness MAWP 3232 psi (App. 22 SF=3) w/ no CA
MIL-F-22606 Class 3000 18" OD	0.561" Min. Wall Thickness TYPE GF or CD per Ref. (1)
DOT 107A 18.5" OD	0.875" Min. Wall Thickness MAWP 5000 psi w/ no CA

C.4 Guidance for Obtaining a Qualified Procedure

The NAVFAC SCA has posted an example of a qualified procedure to conduct thickness and shear wave inspection of flasks on the NAVFAC SCA web site. The web site can be easily found by googling "NAVFAC Hyperbaric Certification" and clicking on the "Technical Library" tab. An example is posted.

Each command that issues a contract needs to ensure that a qualified procedure is created and that the inspector is qualified to conduct the inspection. Also, the command must ensure that qualified equipment will be used to perform the inspection. For questions, contact the NAVFAC SCA.

It is highly recommended that an ultrasonic inspection procedure be submitted to NAVFAC SCA for review prior to conducting inspection.

C

OCSF

REQUEST FOR EQUIPMENT

DATE: _____

FROM:	**Name:**	
	Command:	
	Phone:	
	Fax:	

To: Facility Manager
OCSF Bldg. 252
St. Juliens Creek Annex
Portsmouth, VA 23702
Fax: (757) 396-0479 Phone: (757) 485-6403 (DSN 386-6403)
E-MAIL: hypercert@navy.mil

The following equipment is requested:

EQUIPMENT DESCRIPTION	OCEI / CATALOG NO.

PROJECT:	
REQUIRED ON SITE NOT LATER THAN: DATE:	USE TRANSPORTATION ACCOUNT CODE: TAC #
SHIP TO ADDRESS:	
POC:	PHONE:
Funding will be provided by:	
Projected return date:	

Signature of requestor: _____

OCEAN CONSTRUCTION EQUIPMENT INVENTORY

C

OCSF

REQUEST FOR EQUIPMENT

DATE: 2-Apr-14

FROM: **Name:** NAME

Command: NAVAL SUBMARINE SCHOOL N443 SUBMARINE ESCAPE TRAINER

Phone: XXX - XXX - XXXX

Fax: XXX - XXX - XXXX

To: Facility Manager
OCSF Bldg. 252
St. Juliens Creek Annex
Portsmouth, VA 23702
Fax: (757) 396-0479 Phone: (757) 485-6[illegible] (DSN 3[illegible]64[illegible]
E-MAIL: hypercert@navy.mil

The following equipment is requested:

EXAMPLE

EQUIPMENT DESCRIPTION	OCEI / CATALOG NO.
ONE SET OF CALIBRATION BLOCKS FOR ASME SA372 GRADE J, CLASS 70 20" OD	UNKNOWN
MIN. WALL THICKNESS 1.303 (FROM FORM U-1A)	

PROJECT: SUB ESCAPE TRAINER: FLASK UT/SHEAR WAVE INSPECTION

REQUIRED ON SITE NOT LATER THAN:	USE TRANSPORTATION ACCOUNT CODE:
DATE: 1-Jul-14	TAC #

SHIP TO ADDRESS:

DIRECT MAILING ADDRESS: 592 TAUTOG AVE

NAVAL SUBMARINE BASE

GROTON, CT 06349

POC:	PHONE:
NAME	XX - XXX - XXXX

Funding will be provided by:

NAVFAC SYSTEM CERTIFICATION PROGRAM

Projected return date:
DD-MMM-YY

Signature of requestor: _____

OCEAN CONSTRUCTION EQUIPMENT INVENTORY

APPENDIX D
NAVFAC SCA RELIEF VALVE MAINTENANCE GUIDANCE AND DOCUMENTATION

D.1 FORWARD

This relief valve maintenance document (beginning on pg 24) was originally created because only National Boiler Inspection Code (NBIC) qualified shops were allowed to repair or set American Society of Mechanical Engineers (ASME) Relief Valves. NBIC is responsible for in-service inspection, repairs, and alterations of ASME pressure vessels and qualifies the relief valves and sets the standards as to what shops can perform in-service testing and repair. One of the provisions under the NBIC allows NAVFAC SCA to establish a procedure by which approved shops can perform relief valve testing and limited repair. Parts used to repair valves must be original equipment manufacturer (OEM) parts with associated objective quality evidence. This procedure provides the quality controls and documentation required for NAVFAC SCA approved shops to perform relief valve testing in accordance with this NBIC provision. The form also ensures Diver Life Support System (DLSS) cleanliness requirements are met. Existing forms such as Joint Fleet Maintenance Manual forms and others have been found insufficient with regard to meeting all shore-based NAVFAC SCA requirements.

D.2 APPLICABILITY

The use of this document is required for all ASME relief valves that protect ASME pressure vessels. This guidance also applies for ASME relief valves within Unmanned Pressure Test Facilities (UPTC) and diver gas charging systems within buildings. Use of this document for other relief valves, such as system relief valves protecting reducing regulators, is recommended.

D.3 REQUIREMENTS

Scope Of Certification (SOC) and Re-Entry Control (REC) requirements apply. For Unmanned Pressure Test Facilities (UPTF) a controlled work package is allowed as a REC substitute. The relief valve may or may not be an ASME[1] relief valve. Regardless who performs the work, only in-kind replacement of internal piece parts is authorized. A repair such as replacement of pressure boundary piece parts is not authorized. No configuration changes of any kind are allowed as such changes could negatively impact the relief valve flow capability. Questions regarding SOC or REC should be directed to the owner of this valve prior to proceeding. If owners have questions contact the NAVFAC SCA.

D.4 GENERAL NOTES

All data observed during the test must be regarded as significant. If sufficient space is not provided on this test procedure for recording required data, it shall be made on an attachment to this document. Completed test specifications shall be completely filled in, dated, signed, and/or initialed at each entry. If certain data called for was not recorded, an entry should be made explaining the missing information.

[1] An ASME relief valve can be identified by a unique "V" stamp on it's label plate.

D.5 INSTRUCTIONS

D.5.1 BLOCK A TEST REQUIREMENTS

Block A of the Data Collection Form (see page 24) shall be completed by the relief valve owner. This block shall communicate all necessary requirements to the facility performing the testing. Accuracy of this block is critical to ensure proper testing. A mistake made in this block will likely result in improper relief valve setting and/or loss of cleanliness. While there is only one signature required for this block, the SCA highly recommends a two-party review of the information prior to shipping the valve. The following guidance and examples are provided.

D.5.1.1 RELIEF VALVE SETTING AND TOLERANCE

In order to determine the proper relief valve setting and tolerance, the following criteria has been established as a guideline. Any questions resulting from these criteria shall be directed to NAVFAC SCA:

1) Relief Valve setting is normally 10% over Maximum Operating Pressure (MOP)
2) Tolerance on Relief Valves in NAVFAC systems is normally ± 5%
3) Set pressure with tolerance shall not exceed Maximum Allowable Working Pressure (MAWP) (See 5.1.3)
4) Relief Valve shall reseat above Maximum Operating Pressure (MOP)

Ashore diving and hyperbaric systems are normally designed with an additional 10% allowance between the system's MOP and its pressure vessel's MAWP. It is within this 10% allowance that the relief valve set pressure and tolerance must be established. A system's chamber, volume tank, or high pressure flasks are normally the pressure limiting components. Consequently, their manufacturer records are required to verify the MAWP for each vessel. These vessels are designed and built to American Society of Mechanical Engineers (ASME) standards and each has its MAWP stamped on the vessel and listed in their ASME U1A Manufacturer Data Report. Therefore, the system's MOP and vessel MAWP are required to properly set and test each system relief valve.

Table D.1 Examples of Common Relief Valves Set Pressures and Tolerances

MOP (psi)	Set Pressure(psi)	MAWP(psi)	Lift Tolerance (psi)	Reseat(psi)
100	110	110	110+0/-6	≥100
125	138	150	138±7	≥125
250	275	300	275±14	≥250
3000	3300	3300	3300+0/-150	≥3000
5000	5500	5500	5500+0/-250	≥5000

D.5.1.2 OBTAINING SET PRESSURES AND TOLERANCE INFORMATION

There are several places to look for relief valve set pressures in an ashore system. However, the tolerance is not well documented and shall be checked and adjusted as needed using this procedure. The following offers key places to look for the system's relief valve set pressures and tolerances.

- NAVFAC systems are provided with an Operation and Maintenance Support Information (OMSI) binders that contain copies of system vessel's ASME U1A, relief valve manufacturer specifications and initial set pressure with tolerances testing. Also, system schematics may show the different MOP and relief valve set pressures across the system starting from the high pressure storage through reducing stations to the chamber.

- Additional places to look are the label plate of the ASME relief valve and previous REC packages for each relief valve. The ASME label plate typically lists the set pressure but not the tolerance. If there are no previous records that correctly identify the relief valve set pressure with tolerance, the owner shall apply the above criteria and contact the NAVFAC SCA for approval before sending to shop for adjustment and testing.

D.5.1.3 SPECIAL RELIEF VALVE SETTINGS

Special relief valve set pressure and tolerances are required when diving and hyperbaric systems have vessels that are designed without the normal 10% over MOP. The following two possible solutions may apply in finding a set pressure with tolerances that could work within the vessel's MAWP.

- Lower tolerance solution: Although ±5% is the normal tolerance range, some relief valves may have a lower tolerance that would still be within the manufacturer published tolerance, say ±2%, and still not exceed MAWP and reseat above MOP required above.

- Adjustment of MOP solution: If the set pressure and lower tolerance still does not meet the above requirements, then lowering the system's MOP may be necessary. A request shall be submitted to NAVFAC SCA for changes to MOP and any other relief valve out of tolerance consideration.

D.5.1.4 SYSTEMS PRESSURIZED BY LIQUIDS

Many Unmanned Pressure Test Facilities (UPTF) conduct liquid pressure testing of equipment and relief valve flow is lower for non-compressible liquid than gas. Although the valve set pressure and tolerance are normally the same, the reseat pressure limit must be increased. Therefore, the reseat pressure for liquid systems shall be increased not to exceed 25% of set pressure or as identified by the relief valve manufacturer. An exception is a liquid (i.e. water) tank that has a gas pressure head and use gas relief valves. The relief valve in this example does not qualify for this special setting.

Table D.2 Examples of Special and Fluid Relief Valve Settings

The following first two examples are for chambers that do not have the 10% allowance between the MOP and MAWP. The next two examples are for test chambers that the total volume is pressurized with fluid.

MOP (psi)	Set Pressure(psi)	MAWP(psi)	Lift Tolerance (psi)	Reseat(psi)
89	100	100	100+0/-5	≥89
235	244	250	244+6/-12	≥235
970	1000	1000	1000+0/-200	≥735 (See Note)
15800	16000	1700	1600±800	≥1200 (See Note)

C

Note – UPTF example where water reseat tolerance is 25% below set pressure or as identified by OEM.

D.5.1.5 DIFFERENT STANDARDS

In addition to the NBIC provisions that NAVFAC has implemented, there are also different standards that are used for defining relief valve set pressures and tolerances that have led to confusion among portable and ashore requirements. Vessels used within buildings must follow the NBIC standard per Code of Federal Regulations and National Building Codes, while portable vessels typically follow Department of Transportation (DOT) standards. The setting and tolerance of relief valve protection for DOT flasks is in the 108 – 112% pressure range. Another example where there is confusion is with relief valve settings for MIL-STD 22606 flasks. They have two class pressure ratings of 3000 and 5000 psig according to its military specification. The class 5000 flask is designed for a system MOP of 4500 psig allowing an additional 10% for relief valve tolerance that would not exceed the 5000 psig flask design or MAWP. So, the relief valve set pressure and tolerance for ASME should also be used for MIL-STD flasks. Therefore the relief valve setting is dependent on the vessel's portable or ashore application and the applicable standard.

D.5.2 BLOCK B VISUAL INSPECTION

This block shall be completed by the testing facility. Record the nameplate data of the relief valve being tested. Verify that manufacturer and model/part number matches what the owner specified in Block A. Verify that relief valve is complete and has no visible damage. Do not disassemble the relief valve for this inspection. Check for nicks, cracks, burrs and other visible damage.

D.5.3 BLOCK C CLEANLINESS/CLEANING

This block shall be completed by the testing facility. The purpose is to ensure the valve meets cleanliness requirements (specified in Block A) in the as received condition. This also provides confidence that the valve is not going to contaminate the test facility and that the test facility is not going to contaminate the valve. Disassembly is not required. While most unmanned certified

systems such as hydro test tanks only require good shop practice, some medical research systems may specify the DLSS cleanliness requirements.

D.5.4 BLOCK D TEST SET-UP AND GAGE INFO

This block shall be completed by the testing facility. The set-up presented is considered generic. The purpose is to further ensure cleanliness is maintained by capturing the test medium used and to ensure correct gages are used. For example, this block will ensure that a relief valve's lift pressure of 110 PSI is not verified by using a 0 – 10,000 PSI gage with a 2 inch dial size. Therefore, as guidance, gauges used shall be 4 ½ inch or larger dial size, accuracy of 1% full scale or better, and the full range of the pressure gauge shall be 130% to 150% of the pressure being measured. Digital instruments are acceptable as long as they have been periodically calibrated to a traceable standard that meets the requirements of the National Institute of Standards and Technology (NIST).

D.5.5 BLOCK E IN-SERVICE OPERATIONAL TEST

This block shall be completed by the testing facility. This block is to collect information regarding how well this valve would have performed if it were called upon to relieve pressure during an abnormal over pressurization incident. The purpose of recording the first crack and reseat of this valve is to see if any change in the set pressure has occurred. Required crack and reseat pressure can be obtained from Block A. Relief valve shall be installed in a test set-up functionally similar to Block D. Ensure all test components are appropriately rated for test pressure and that the regulated pressure source has overpressure protection. Open valve V-2 and slowly apply pressure until valve cracks open. Record the in-service cracking pressure (G-1) in the appropriate space. Increase pressure sufficiently to fully unseat the relief valve and then slowly decrease the pressure until reseat occurs. Shut valve V-2. Record the in-service reseat pressure in the appropriate space. If the cracking pressure does not meet the requirements of Block A, the valve must be adjusted until the correct pressure range is attained. If any adjustments are made, record in remarks and briefly indicate the type of adjustment (ie. ¼ turn clockwise). If adjustment is successful, proceed to Block F. If settings cannot be achieved, then the valve will need to be disassembled and repaired. If this is required, proceed to Block G.

D.5.6 BLOCK F OPERATIONAL TEST

This block shall be completed by the testing facility. Required crack and reseat pressure can be obtained from Block A. Open valve V-2 and slowly apply pressure until valve cracks open. Record the cracking pressure (G-1) in the appropriate space. Increase pressure sufficiently to fully unseat the relief valve and then slowly decrease the pressure until reseat occurs. Shut valve V-2. Record the reseat pressure in the appropriate space. Test the cracking and reseat pressure points two additional times by repeating the operational test. To the maximum practical extent, the recorded pressures from test 1 through 3 should be the same. As guidance suggests, recorded pressures should be within 0.5% of each other or as recommended by the original manufacturer. If repeatability cannot be demonstrated the valve needs to be repaired.

D.5.7 BLOCK G RELIEF VALVE REPAIR

This block shall be completed by the testing facility. Configuration changes are not authorized. Only in-kind replacement of internal pieces including soft goods is allowed. Details of necessary repairs are to be captured in this block. List all pieces and work performed. Add sheets if necessary. Upon completion of this block, complete Block F prior to completing Block H.

D.5.8 BLOCK H SEAT TIGHTNESS TEST

This block shall be completed by the testing facility. The purpose is to ensure that a repaired valve does not leak prior to shipment. Seat tightness testing must be conducted with the correct test fluid. If the valve was removed from a helium or helium-oxygen system it must be tested with helium. Air, nitrogen, or oxygen systems can be tested with clean oil-free nitrogen, clean divers quality air, or helium. Water valves shall be tested with clean water. The following requirements shall apply.

D.5.8.1 AIR, NITROGEN, OXYGEN SYSTEMS

Using Block D set-up, apply pressure until the relief valve cracks open, then slowly decrease the pressure until reseat occurs. Monitor pressure for 3 minutes minimum. No leakage allowed, unless testing with helium where the 0.6 cc per minute leakage applies.

D.5.8.2 HELIUM AND HELIUM-OXYGEN SYSTEMS

Using Block D set-up, apply helium pressure until the relief valve cracks open, the slowly decrease the pressure until reseat occurs. Monitor pressure for 5 minutes minimum. Only 0.6 cc per minute leakage past the seat is allowed. One method to measure acceptable leakage is to connect tubing to the outlet of the valve and place the outlet of the tubing into the underside of a water filled inverted graduated beaker. Displacement of water within the beaker will measure leakage when timed by stopwatch. Optional methods are acceptable if properly documented.

D.5.8.3 WATER SYSTEMS

Using Block D set-up, apply water pressure until the relief valve cracks open, then slowly decrease the pressure until reseat occurs. Monitor pressure for 3 minutes minimum. No leakage allowed.

D.5.9 BLOCK I BODY JOINT TIGHTNESS

This block shall be completed by the testing facility. During Block H seat tightness testing, monitor any body joints disturbed during valve repair. For gas, use leak detection compound to prove joint is bubble tight. For water, verify no signs of visible leakage. If failure of this test requires disassembly, Block F through Block H must be redone.

NAVFAC SCA RELIEF VALVE MAINTENANCE DOCUMENT

NOTE

Anyone completing any portion of this Data Collection Form shall first read and understand the instructions. Failure to comply with the instructions could compromise certification.

BLOCK A **TEST REQUIREMENTS:**

Relief Valve Owner / Requesting Facility _____
Point of Contact / Phone Number_____

Check Type of Certified System: _____Manned DLSS _____Unmanned Pressure Test

System Valve Number_____ (i.e. AHP 1-1)

Manufacturer:_____ Model/Part Number_____

Specify level of cleanliness: _____DLSS MIL-STD-1622 _____DLSS MIL-STD-1330

_____Good Shop Practice (UNMANNED/Clean H2O)

Normal System Fluid _____ Air _____ Helium _____Helium-Oxygen _____ Oxygen

_____N2 _____H2O Other Specify_____

MOP:_____PSI Set Pressure:_____PSI Lift Tolerance_____PSI Reseat ≥_____

After successful testing ship to address provided ⟶ _____

_____

_____

_____

Print Name_____ Signature/Date_____

BLOCK B **VISUAL INSPECTION:**

Manufacturer:_____ Model/Part No._____

Serial No._____ Visual Inspection is SAT____ UNSAT____

Print Name_____ Craftsman Signature/Date_____

BLOCK C **CLEANLINESS/CLEANING:**

Cleanliness IAW MIL-STD-1622 or MIL-STD-1330 as required. Test Set-up of Block D must meet requirements.

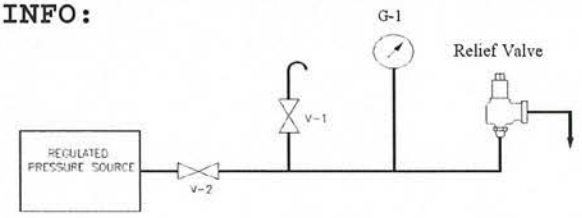
Cleaning Standard _____ MIL-STD-1622 _____ MIL-STD-1330 _____ Good Shop Practice UNMANNED/Clean H20

Cleaning/Cleanliness is : SAT_____ UNSAT_____

Print Name_____ Craftsman Signature/Date _____

NAVFAC SCA RELIEF VALVE MAINTENANCE DOCUMENT

BLOCK D **TEST SET-UP AND GAGE INFO:**



Test Medium Used_____
(i.e. - Dry Oil Free N2, Clean H2O etc)

Gage Range_____ Gage S/N_____ CAL Due Date_____

Print Name_____ Craftsman Signature/Date _____

BLOCK E **IN-SERVICE OPERATIONAL TEST:**

In-Service Cracking Pressure _____ PSI In-Service Reseat Pressure _____ PSI

Adjustments Made: Yes____ No_____ Remarks _____

_____

Print Name_____ Craftsman Signature/Date _____

BLOCK F **OPERATIONAL TEST:**

Test	1st Test	2nd Test	3rd Test
Cracking Press (PSI)			
Reseat Press (PSI)			

Note: Following completion fabricate a metal tag that contains valve P/N, serial number, date tested, set pressure, and associated REC number. Install tag on the valve with lockwire.

Print Name_____ Craftsman Signature/Date _____

BLOCK G **RELIEF VALVE REPAIR:**

Reference(s)_____

Piece Parts Replaced_____

_____
(Note - Attach Certificates of Conformance and/or Procurement Documentation for Parts Replaced)

Repairs Performed_____

Cleanliness Per Block C Maintained Yes____ No____
(Note - Attach packaging from softgoods (O-rings, Teflon seats, etc) with evidence of cleaning).

Remarks_____

Print Name_____ Craftsman Signature/Date _____

NAVFAC SCA RELIEF VALVE MAINTENANCE DOCUMENT

BLOCK H **SEAT TIGHTNESS TEST:**

Upon reassembly, perform operational testing per Block F of this document. After completion of Block F the following shall be accomplished.

For Air, Nitrogen or Oxygen reference paragraph 5.8.1

Reseat Pressure_____ PSI (Reseat Pressure = Block A requirements)

Test Duration_____ Minutes (3 Minutes Minimum)

Seat Tightness Test Is SAT_____ UNSAT_____

For Helium And Helium-Oxygen Systems reference paragraph 5.8.2

Reseat Pressure_____ PSIG (Reseat Pressure = Block A requirements)

Time @ Start_____ Time @ End_____ (24 Hour Clock 5 Minutes Min)

Graduated Beaker @ Start_____ml Graduated Beaker @ End_____ml

$$\text{Leakage} = \frac{\text{Difference in Beaker Readings (ml)}}{\text{Time Difference (min)}} = \_\_\_\_\_ \text{ cc/min.}$$

Remarks_____
(Optional methods may not include monitoring a gage, where 0.6 cc/min is not quantifiable. Other methods may include maintaining a meniscus bubble over the outlet of the piping for the duration).

Optional Method Remarks_____

For Water Systems reference paragraph 5.8.3

Reseat Pressure_____ PSI (Reseat Pressure = Block A requirements)

Test Duration_____ Minutes (3 Minutes Minimum)

Seat Tightness Test Is SAT_____ UNSAT_____

Print Name_____ Craftsman Signature/Date _____

BLOCK I **BODY JOINT TIGHTNESS TEST:**

During the Block H seat tightness test, monitor any body joints disturbed during valve repair in accordance with paragraph 5.9.

Body Joint Tightness Test is SAT _____ UNSAT _____

If UNSAT and disassembly is required to repair, Block F through Block H must be redone.

Print Name_____ Craftsman Signature/Date _____

APPENDIX E
ACTIVITIES AUTHORIZED TO TEST/REPAIR ASME RELIEF VALVES

E.1 FACILITY ADDITION

NAVFAC SCA approval is required for a non-NBIC qualified shop to be added to this list. Any Government – Naval Facility or private company that is seeking to be added to this list can contact NAVFAC SCA at hypercert@navy.mil. The approval process includes, but is not limited to: review of an adequate quality assurance program; verification of ability to maintain diver life support system cleanliness and/or clean to the requirements of MIL-STD-1330 and/or MIL-STD-1622 as applicable; working level knowledge of diver re-entry control procedures, and assurance that the NAVFAC Relief Valve Maintenance Form is understood and will be accurately completed.

E.2 AUTHORIZED ACTIVITIES

Please contact NAVFAC SCA for a current list of activities authorized to test/repair ASME relief valves.